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SAFETY AND HEALTH STANDARDS FOR AGRICULTURE

Guarding of Farm Field Equipment, Farmstead Equipment and Cotton Gins

Title 29—Labor

CHAPTER XVII—OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, DEPARTMENT OF LABOR

[S-74-3]

PART 1928—OCCUPATIONAL SAFETY AND HEALTH STANDARDS FOR AGRICULTURE

Guarding of Farm Field Equipment, Farmstead Equipment, and Cotton Gins

Pursuant to section 6(b) of the Occupational Safety and Health Act of 1970 (84 Stat. 1593; 29 U.S.C. 655), Secretary of Labor's Order No. 12–71 (36 FR 8754) and 29 CFR Part 1911, Chapter XVII of Title 29, Code of Federal Regulations, is hereby amended in the manner set forth below, by adding a new Subpart D and § 1928.57 in Part 1928, to provide a new standard for the guarding of farm field equipment, farmstead equipment, and cotton gins.

I. *Background.* Machinery accidents have been a major cause of employee injury and death on the farm. In recognition of this serious problem, the Standards Advisory Committee on Agriculture ("SACA") convened a subcommittee to study possible solutions in Iowa City, Iowa, on December 19, 1972. The subcommittee subsequently met in Denver, Colorado, on March 14 and 15, 1973, in St. Louis, Missouri, on April 13, 1973, and in Washington, D.C. on June 7 and 8, and August 20 and 21, 1973. The subcommittee's recommendations were adopted by the full Committee and submitted to the Assistant Secretary of Labor for Occupational Safety and Health on September 19, 1973.

On February 8, 1974, a proposed standard for guarding of agricultural equipment was published in the FEDERAL REGISTER (39 FR 4925). It was substantially based on the recommendations of the SACA. Interested persons were given 60 days to submit written data, views, and arguments concerning the proposal. Objections and requests for an informal hearing were also invited.

Following an extension of the time period for receipt of written comments (39 FR 11432; March 28, 1974), and upon receipt of numerous requests for a hearing, a notice was published in the FEDERAL REGISTER on July 31, 1974 (39 FR 27708) pursuant to section 6(b)(3) of the Act, scheduling an informal public hearing on the proposal at four locations. A correction to that notice was published on August 2, 1974 (39 FR 27916). The hearing requests raised 12 major issues, which were specified in the notice of hearing as issues to be addressed at the hearing.

The informal public hearings were held on August 22, 1974, in Washington, D.C.; on August 26, 1974, in Madison, Wisconsin; on August 29, 1974, in Phoenix, Arizona; and on September 4, 1974, in Oklahoma City, Oklahoma. The record of the rulemaking proceeding includes all evidence considered by the SACA and the Assistant Secretary in developing the proposed standard including approximately 450 pages of testimony received by the Committee and subcommittee, the recommendations of the SACA, over 350 written comments submitted by interested persons in response to the proposal, evidence submitted into the record by the Occupational Safety and Health Administration (OSHA), approximately 540 pages of testimony and 67 exhibits received at the hearing and over 30 post-hearing comments. The entire record was thoroughly reviewed and evaluated in reaching the determinations set forth below and in developing this final standard.

II. *The final standard.* (1) *Generally.* Briefly, the final standard contains general requirements applicable to all covered agricultural equipment (paragraph (a)), and, in paragraphs (b), (c) and (d), contains particular requirements for farm field, farmstead and cotton ginning equipment respectively. Provisions which are equally applicable to all covered equipment, such as the basic requirement for guarding farm machinery, the priority for the use of guards or guarding by location over the use of guardrails, certain design requirements of these guarding methods, special provisions for servicing and maintenance of equipment, and general requirements for training of employees are, where possible, included in paragraph (a). This has necessitated some reorganization of the provisions contained in the proposal and the movement of some requirements from proposed paragraphs (b), (c) and (d) into paragraph (a) of the final standard. Minor, insubstantial changes of language have also been made in order to accommodate this organizational framework of the standard. In addition, the applicability of certain proposed requirements to farm field and/or farmstead equipment has been clarified in the final on the basis of comments received as to the appropriateness of particular provisions of the proposal for particular types of agricultural machinery.

The final standard requires that all farm field and farmstead equipment, regardless of date of manufacture, be provided with guarding of the power take-off drive. The proposed requirement that all power transmission components be fully guarded has been changed to require only nip-point guarding, and the proposed retrofit requirement has been eliminated for guarding of power transmission components other than power take-off drives. Nip-point guarding of power transmission components will be required on all farm field and farmstead equipment manufactured on or after June 7, 1976.

The final standard retains the requirement contained in the proposal that employee operators be instructed in the safe operation and servicing of machinery which they operate, and retains, with some modification, requirements that functional components be guarded. In addition, means must be provided to prevent inadvertent application of electrical power to farmstead equipment. Further, all cotton gin power transmission and functional components must be guarded by June 30, 1977. The final standard, modifying the proposal in this regard, requires that a warning sign be posted where a component continues to rotate after power is shut off and that, on new equipment, a visible or audible warning be installed as well.

(2) *Issues involved in the proceeding.* Following is a discussion of the major issues which were specified in the notice of hearing and involved in the proceeding, and of the significant changes reflected in the final standard.

(a) *Whether an agricultural machinery guarding standard will improve safety in the agricultural workplace.* It was a matter of general agreement that unguarded agricultural machinery presents a significant hazard. (See e.g. Transcript ("Tr.") I–20, 123). The National Safety Council ("NSC") estimated, in "Accident Facts," (1973) (Exhibit ("Exh.") 8), that agriculture is the country's third most hazardous industry, involving an estimated 2,200 fatalities and 200,000 disabling injuries in 1972. The NSC also estimated that 20% of all injuries reported in agriculture between 1969–1972 were related to the use of farm machinery, and that the average time lost for injuries of the "caught in between" category was 18.7 days, with an average medical cost of $228. (See Exh. 8: "Accident Facts," (1973), p. 86; and NSC's 10 State Accident Survey ("10 State Study"). See also Tr. I–10). The "Study of Work Injuries in California Agriculture" (1970) (Exh. 8), one of the state studies included in the record, found that approximately 9% of disabling injuries in 1970 in California agriculture involved machines, and that 6% of disabling injuries were of the "caught in or between" type. A substantial hazard to employees is clearly presented by unguarded agricultural machinery.

While these statistics are helpful in reaching the conclusion that unguarded machinery is hazardous, they are admittedly deficient in several respects. First, although a significant number of accidents categorized as "caught in between" have clearly been caused by moving machinery parts, not all "caught in between" accidents are necessarily accidents resulting from persons being "caught in between" moving machinery parts. Second, these statistics are not very helpful in determining the relative hazard of the various types of agricultural machinery. Nevertheless, in view of the clear hazard involved, we cannot withhold regulation until indisputable evidence establishes the precise degree of hazard associated with the various types of agricultural machinery. We have therefore exercised our best judgment, based on the evidence which is available as to what is appropriate and necessary to protect employees.

As will be discussed more fully below, we believe that a farm machine guarded against the hazards which are known to cause injury, and operated by an employee well-instructed in the methods of operating the machine, will significantly improve safety in agricultural workplaces (Tr. I–31).

(b) *Whether a retrofit requirement is feasible and necessary to provide adequate safety for employees.* Most of the participants in the rulemaking proceeding were opposed to the proposed requirement for retrofit of all machinery. While the final rule does not require retrofit of all machinery, it is required for certain machinery. The issue of retrofit will be addressed fully below in connection with the discussion of specific machinery.

(c) *Whether a warning device indicating rotation of those components which may continue to rotate after the power is disengaged is helpful, feasible, or necessary for improved safety, and, if so, the type of device that should be used.* This issue arose out of the requirement in paragraphs (b)(4)(iii) and (c)(4)(iii) of the proposal that an audible warning be provided in the immediate area of any component which continues to rotate after the power is disengaged. The comments and hearing testimony on this issue were directed not to the question of whether some type of warning was necessary, which was conceded, but as to whether such warnings should be restricted to an audible device.

It is clear that an effective warning device is necessary to protect employees, since certain components continue to rotate at extremely high speeds after power is disengaged and such movement is not readily apparent to an employee operator (e.g. Tr. I–50–51, II–57–59, IV–79–80, 107, Exhs. 13, 62, 65). The SACA recommended that "a suitable warning" be required. (See Exh. 6). After the proposed audible warning requirement was published, the SACA, acting on its own, reiterated its recommendation that any suitable warning be required. In addition, manufacturers, farmers, and employees all agreed that, while audible warnings are effective, an audible warning requirement was too restrictive, since a visual warning could also adequately inform the employee of the rotating component. Moreover, in some circumstances, an audible warning may be less reliable than a visual warning. For example, an audible warning may not be discernible in an area where other machinery is operating. Manufacturers in particular also testified that permitting "only a single type of warning device in all situations unnecessarily restricts design and prevents engineers from deciding what type of warning is most appropriate and reliable for a given machine." (John Deere testimony, Tr. II–57). Finally, depending upon the type of machine and the type of hazard, "more than one type of safety communication may be desirable to provide adequate warning." (Tr. II–57). In view of this evidence, there appears to be no reason to limit the warning mechanism to an audible one.

Accordingly, the final standard in paragraphs (b)(4)(ii)(A) and (c)(4)(ii)(A), requires a readily visible or audible warning of rotation where removal of a guard or access door exposes an employee to any component which continues to rotate after the power is disengaged. This warning of rotation need not be a special device, such as a bell or flashing light, as long as it adequately warns the employee, for example through the clicking sound of an overriding clutch, that the component is still rotating. In addition, a new provision has been added requiring that a sign must be conspicuously posted which tells the employee to look and listen for evidence of rotation and not to remove the guard or access door until all components have stopped. This sign is viewed as an element of the requirement in paragraph (a)(6) that employees be trained regarding the safe servicing and maintenance of equipment; it is also related to the requirements for warning signs near other moving machinery parts, such as power take-off shafts. We believe that the above requirements are necessary to protect employees from this hazard.

The final rule requires the warning sign to be conspicuously posted on all machinery, regardless of the date of manufacture. The requirement to retrofit existing machinery with warning signs does not appear to pose any unusual technological difficulties. However, contrary to the proposal, a visible or audible warning is not required for existing machinery because of the technological difficulties inherent in meeting such a requirement. Thus, in order to be effective, a warning device must be an integral part of the machine and often must be protected against the agricultural environment. It is clear that a warning device which is not functioning properly may well present a greater hazard to employees than no warning device, by creating a false sense of security. Yet, if retrofit were required, we do not have reasonable assurances that effective warning devices would be installed. Thus, in many instances, farm machinery was not designed for an audible or visual warning. Employers, who often may not be technically qualified to design and install such a device, would be forced to either install a "homemade" device or seek the services of a custom machine shop, which itself may not be qualified to design and install an effective visual or audible warning device. In these circumstances, we do not believe that a retrofit requirement would meaningfully increase employee safety.

The requirement for a visible or audible warning device applies to equipment manufactured after June 7, 1976. This will allow manufacturers a period to install warning devices on new equipment.

(d) *Whether full guarding of power transmission components (other than power take-off shafts) is necessary and feasible to provide safety for employees, or whether nip-point guarding is adequate.* Employers and manufacturers contended that the proposal, which would have required full guarding of all power transmission components of farm field and farmstead equipment, should be changed in the final rule to require only nip-point guarding. This suggestion was consistent with the SACA recommendations, which would have required only nip-point guarding. In large part, this argument was based on the lack of showing any safety need for full guarding, with the exception of the power take-off shaft (see issue (g) below, e.g. Tr. I–110, II–64–65, IV–81).

The accident statistics indicate that either full guarding or nip-point guarding will significantly increase employee safety. However, these statistics are not helpful in determining the relative effectiveness of full guarding vs. nip-point guarding, particularly with respect to preventing serious injuries. It is clear from the record, however, that nip-point guarding is far more feasible than full guarding. Thus, full guarding, unlike nip-point guarding, would often seriously impede the function of the machine, so that it would be impossible for such machinery to efficiently perform its intended function. The nature of agricultural operations, unlike general industry operations, inevitably exposes agricultural machinery to conditions which require continual unclogging, maintenance, monitoring, servicing, and adjusting. (Tri. II–99–101). Clearly, full guarding would impede these functions far more than nip-point guarding (e.g. Tr. I–32, 105, 106; Tr. IV–80–82).

Additionally, the economic impact of requiring full guarding would be substantially greater than the economic impact of requiring nip-point guarding. Thus, a manufacturer estimated that full guarding would increase the cost of certain machinery by 10% (Tr. I–106). Factors such as new design, a two season testing period, and an increase in the amount of materials used would contribute to the increased cost. On the other hand, since nip-point guarding is presently provided by manufacturers of agricultural machinery (e.g. Tr. I–118, 126; Tr. II–65), the economic impact of requiring nip-point guarding for all hazardous exposed moving machine parts would be expected to be relatively minor. Accordingly, in view of the questionable value of full guarding over nip-point guarding in preventing serious injuries and in view of the significant feasibility problems associated with a requirement for full guarding, the final rule requires nip-point guarding of power transmission components (other than power take-off shafts) in farm field and farmstead equipment. (The requirements for full guarding in cotton gins is retained, however. See discussion below.)

Most participants were against the proposed retrofit requirement for guarding of power transmission components other than power take-off shafts. Among the arguments presented against retrofit were the following: (1) the accident statistics do not support a retrofit requirement (e.g. Tr. II–56; IV–77–78); (2) such guarding is not presently available in sufficient quantities to meet the anticipated demand (e.g. Tr. I–118–120); (3) manufacturers are having difficulty meeting the demand for new equipment and an additional heavy demand for guards for old equipment could probably not be adequately met until the availability of materials increases and/

or demand for new equipment decreases (e.g. Tr. II–75, Exh. 58); (4) the cost of retrofit is not warranted and may result in the premature obsolescence of some farm machinery (Exh. 7); and (5) employers who are unable to obtain guards from manufacturers will be required to purchase costly custom made guards or make their own guards, which may be of questionable quality and contribute to a false sense of security on the part of employee operators (e.g. Tr. I–107; II–56).

After careful consideration of the above arguments and the SACA's recommendation against a retrofit requirement for nip-point guarding, we have decided for the following reasons not to require employers to retrofit.

While it is true that unguarded nip-points do present a hazard to employees, it is clear that the hazard is not as severe as that presented by other farm machinery parts, such as power take-off shafts (e.g. Tr. I–121, and issue (g), below.)

In addition, a retrofit requirement would present severe technological and economic difficulties. Thus, in many instances, existing farm machinery was not designed for guarding of many nip-points. Therefore, in order to meet the demand which would be created by a retrofit requirement, manufacturers would have to direct their resources from the manufacture of new machinery which meets the requirements of the standard, and from research and development of new technology which is intended to increase safety in agricultural workplaces, into attempts to design and manufacture guards for existing machinery. And, those employers who are unable to obtain guards from manufacturers would either purchase costly guards which are custom designed, manufactured, and installed, or be forced to make their own guards, which may provide inadequate protection.

The economic impact of requiring retrofit of nip-point guarding would, in our view, be substantial. Evidence in the record put the cost of retrofitting farm machinery with full guards at up to one billion dollars (e.g. Exh. 7). While we recognize that this estimated impact for full guarding retrofit is substantially higher than the cost of a retrofit requirement limited to nip-point guarding, and while we cannot on the record before us precisely determine the economic impact of a retrofit requirement for nip-point guarding, we believe it is clear that the impact would be substantial. In addition, we agree that premature obsolescence of some machinery would result if retrofit were required. That is, employers could be placed in a position in which the cost of retrofit would force them to purchase a new machine rather than retrofit an older machine which is still adequately performing its intended function.

Attempts to arrive at a solution between no retrofitting and full retrofitting of nip-point guarding were made, including consideration of the possibility of requiring machines to be provided with the type of guard originally supplied with the machine, i.e., to ensure that farm employers would at least maintain the equipment in its original safety condition rather than allowing broken and worn out guarding to go unreplaced. While many favorable comments were received with respect to this suggestion (e.g. Tr. II–22, 32), and while it would meet some of the technological and economic feasibility problems of full retrofitting, more substantial opposing testimony was received. In particular manufacturers pointed out that although some backlog of parts was kept, their stock of old guards would clearly be inadequate to meet the demand that would be created by a retrofit requirement. (E.g. Tr. I–98, 119–120, II–78–81). Many of such guards were manufactured by companies that have since gone out of business. (Tr. I–119). In any event, where retooling is needed to produce these guards, the cost of such guards might be quite high for the hazard being protected against. In addition to the general unavailability of guards to meet a retrofit requirement, very serious enforcement problems would be created by a requirement contingent not on a readily ascertainable date of manufacture, as is the case with the final standard promulgated herein, but on whether the machinery had been designed for guarding.

In view of these factors, the final standard applies the guarding requirements of paragraphs (b)(2) and (b)(3), and (c)(2) and (c)(3) only to equipment manufactured after June 7, 1976. We believe that the final rule represents an appropriate consideration of safety and feasibility factors. Thus, under the final rule, a significant and growing number of employees will be protected from the hazards associated with unguarded machinery, while the substantial technological and economic difficulties which would result from a retrofit requirement in this case will be avoided.

As discussed more fully below, however, power take-off shafts must be retrofitted in view of the significantly greater hazard presented by power take-off shafts and in view of the fact that PTO guarding has been provided for many years. In addition, as noted below, cotton gins will have to be retrofitted when the requirements of paragraph (d) become effective on June 30, 1977.

(e) *Whether strength requirements for guards should be included in the standard and, if so, in what manner the requirement should be stated.* This issue principally involved the extent to which strength requirements for guards should be specified, rather than be phrased in terms of the performance required. Manufacturers testified that the specification of strength requirements would unnecessarily restrict the design of guards (e.g., Tr. I–111–112, 123–124; Tr. II–65–66, 84–85), which should be designed to perform a particular function, and which, depending upon the location of the guard, might have to withstand forces ranging from a few pounds to several hundred pounds. We agree. Accordingly, the final rule establishes a performance standard which requires every guard to be capable of withstanding the force that a 250 pound individual, leaning or falling against the guard, would be expected to exert upon that guard. The actual strength that a particular guard must have will therefore be dependent on a consideration of this parameter along with location of the guard, materials used, etc. In addition to the adoption of performance language with respect to the strength of guards, the final standard, in paragraph (a)(10), has eliminated the specification requirements of the proposal as to standard railings and replaced them with performance language. Thus for farm field and farmstead equipment in particular, the usual requirements as to height and construction of guardrails would often prove inappropriate. For cotton gins, however, which more closely resemble conditions in general industry, some of the design requirements for guardrails have been retained in paragraph (d)(1)(ii).

(f) *Whether there are instances where a guard should not be required at all because of the component's location and, if so, specifically what these instances are.* The proposed concept of guarding by location was universally endorsed. Clearly, where a component is located so that it does not present a hazard, it is unnecessary to also require a guard. Accordingly, the final rule establishes a performance standard which permits guarding by location.

Under the proposal, all components which are seven feet or more above the working surface would have been considered guarded by location. However, it was pointed out that this provision failed to take into account the possibility that certain components which are more than seven feet above the working surface may nevertheless present a hazard (comment 330). Difficulties are inherent in any attempt to select a specific height requirement which will be appropriate in all circumstances. The final rule, therefore, permits employers to guard by location only where no employee can inadvertently come into contact with the hazard, regardless of the distance between the component and the working surface.

(g) *Whether the requirements for power take-off guarding are adequate or necessary to provide safety for employees.* It was generally agreed that an unguarded power take-off shaft is recognized throughout the agricultural industry as extremely hazardous; that power take-off injuries are usually quite severe; and that because of the extreme hazard, power take-off guarding is necessary for old as well as new equipment (e.g. Tr. I–15, 36, 44, 66, 108, 128, II–19, 67–69, Exhs. 11 and 32). The principal issue regarding power take-off (PTO) shaft guarding that arose during the rulemaking proceeding was the amount of time necessary to install guards on existing power take-off shafts.

PTO guarding has been provided by farm machinery manufacturers for many years, "probably 50 years" by International Harvester (Tr. I–117) and over

34 years by John Deere (Tr. II–77). Manufacturers and others testified, however, that they needed time to produce guards to meet the anticipated increased demand resulting from a final rule, and that particularly for older machines an extended time lag was necessary (e.g. Tr. II–74–75). Nevertheless, it appears clear to us that allowing a delayed retrofit for PTO guarding cannot be reconciled with the fact that an unguarded PTO shaft is clearly a recognized hazard likely to cause death or serious physical harm to exposed employees and has been enforced as such under section 5(a)(1) of the Act (84 Stat. 1593, 29 U.S.C. 654). The SACA also recognized the need for PTO retrofit and included a PTO retrofit requirement in the recommendations to the Assistant Secretary.

In making their estimates that extra time was needed to manufacture PTO guards for retrofit purposes, manufacturers admitted that these time figures were just estimates, and that there was no way to determine the increase in demand for such guards for existing equipment (e.g. Tr. I–116–117, II–79). In light of the gravity of the hazard, we decline to sanction any delay in retrofit simply because there is some possibility that PTO guards may not be immediately available to all employers. Accordingly, the standard does not provide any delay in the PTO guarding requirement beyond the effective date of the rest of the standard.

Manufacturers testified that retrofit should not be required for tractor mounted implements attached by three-point hitches, since the shafts of three-point hitch tractors are guarded by location (e.g. Tr. I–92–95). While it is true that these shafts are less accessible to operators than the ones on towed equipment (Exh. 18), they are located within an arm's length and can be contacted and cause injury if unguarded. Manufacturers have recognized this fact and have guarded such PTO shafts in recent years. An exemption for this type of shaft cannot be justified.

Accordingly, based upon the foregoing, and particularly noting the severe hazard presented by an unguarded power take-off shaft, the final rule continues our present policy of requiring full guarding of all power take-off shafts, regardless of the date of manufacture.

In addition, to clarify the intent of proposed paragraph (c)(1), which required the guarding of power take-off driven equipment and any portion of the PTO shaft which protrudes from the tractor, an explicit provision has been included in paragraph (c)(1)(i) of the final standard requiring guarding of PTO shafts on farmstead equipment.

(h) *To what extent functional components (points of operation) should be required to be guarded and how these requirements should be specified.* The relatively few comments received on this issue were concerned principally with the clarity of wording of paragraph (b)(3) of the proposal (e.g. Tr. I–60–61). The intent of the proposal was to require guarding of these components to the extent possible, recognizing that such components often cannot be guarded without substantially impeding normal operation of the equipment. We have attempted to clarify paragraph (b)(3) by changing the proposed requirement from "shall be shielded to a degree consistent with the intended function of the component," to "shall be guarded to the fullest extent which will not substantially interfere with normal functioning of the component." A paragarph (c)(3)(i), with language similar to paragraph (b)(3), has been added, to make explicit the application of this principle to farmstead equipment.

Comments were also received concerning the proposed paragraph (c)(3)(ii) requirements on auger flighting. These comments argued that the American Society of Agricultural Engineers (ASAE) recommendation R354, "Safety for Farmstead Equipment," from which this language was adopted, was intended to apply only to portable augers, and that the restrictions in the proposed rule would prevent normal use of other than portable augers, since the size of openings would not allow certain materials to pass through (e.g., comment 291, 330). It was also pointed out, citing the same ASAE recommendation that the requirement, contained in paragraph (c)(3)(i) of the proposal, for the guarding of sweep arm gathering mechanisms in bulk storage structures was intended in its application to be limited to silos, and would not be appropriate for all bulk material storage facilities (comment 330). This is because the sweep arm gathering mechanisms in silos is located on the top surface of materials, whereas in other bulk storage facilities they are located on the bottom of the structure and are buried under the stored material. Since it is inappropriate to apply paragraph (c)(3)(i) of the proposal to all bulk material storage structures and to apply paragraph (c)(3)(ii) of the proposal to non-portable augers, the final rule reflects the appropriate limitations in paragraphs (c)(3)(ii) and (c)(3)(iii) respectively. In addition, since the record does not provide any information as to specific requirements necessary or appropriate to protect employees working with non-portable augers or in other bulk material storage facilities, the final rule contains no specific requirements for these situations. However, the general requirements of the final rule apply in these circumstances and, if appropriate, future rulemaking proceedings will be initiated to determine whether specific requirements are necessary or appropriate for nonportable augers and bulk material storage structures.

(i) *What method should be specified to prevent inadvertent application of electrical power.* The two principal areas of comment on the proposed requirements on inadvertent application of electrical power to farmstead equipment (paragraph (c)(5) of the proposal) were with respect to equipment driven by more than one electric motor (e.g., Exhibit 51, Tr. III–18–26) and the issue of whether locking out of power should be required. It was generally agreed that a manual reset requirement for circuit protection devices is appropriate to protect employees servicing machinery from the unexpected application of power to the motor. The final rule, therefore, incorporates this requirement for manual reset, except as noted below, with respect to all equipment, regardless of the date of manufacture. However, manufacturers of center pivot irrigation equipment argued that manual resets are impractical for most center pivot irrigation equipment because the equipment is designed to automatically turn off when an obstruction is encountered, and automatically turn on again after a preset time period. The equipment is often located considerable distances away from areas where employees ordinarily work; it is routinely checked only on a daily basis; and the equipment is ordinarily spread out over many acres. Recognizing the hazard, they recommend that a circuit disconnect switch be required within 15 feet of each motor to protect employees (Tr. III–18–26). Other equipment such as well pumps for cattle watering would be similarly impacted by a manual reset requirement. Based upon the above considerations, we have decided, in paragraph (c)(5)(ii)(A) of the final standard, to allow automatic resets where manual resets would be infeasible because of the nature of the operation, the distances involved, and the amount of time normally spent by employees in the area of the affected equipment.

The final rule, in paragraphs (c)(5)(ii)(B) and (C), requires employers who meet the above criteria and choose to use automatic resets to locate an electrical disconnect switch within 15 feet of the equipment. In addition, a sign must be prominently displayed near each hazardous component which warns employees that the motor could automatically start unless the electrical disconnect switch is utilized.

Some commenters objected to the provisions of the proposal requiring locking out of power, arguing that no lockout should be required if the equipment to which power is to be applied is entirely visible from the switch location (comment 66). It was also argued that pulling the plug at the electrical outlet and tagging it should be considered a lockout means (e.g., comments 7, 89). It was recognized by other witnesses, however (e.g. Tr. I–33–34, II–116–119) that lockouts are a common and inexpensive measure to protect employees working on machinery. We believe that relying on visibility of the equipment, where vision may be obstructed or other individuals may not look carefully before switching on power, is not justified, particularly in light of the relatively low cost of installing a locking means on a switch. Similarly, reliance on the mere pulling and tagging of the plug is not justified. Accordingly, we decline to allow non-lockout means as a method for preventing inadvertent application of electrical power. Since the final standard, in paragraph (c)(5)(i)(A), requires an exclusive posi-

tive locking means on the main switch, the proposed requirement that equipment not be designed for remote start-up has been eliminated, as it is unnecessary and redundant (see e.g., comment 330).

In light of the foregoing considerations, and the fact that none of the comments opposed the proposed retrofit, the final standard requires retrofit of existing farmstead equipment with the electrical disconnect means of paragraph (c)(5). However, to provide sufficient time to implement this requirement, the effective date of paragraph (c)(5) will be September 7, 1976.

(j) *Whether instruction of employees in safe operation and servicing of equipment should be required, and if so, to what extent and what documentation, if any, should be required.* Overwhelming support was expressed for the proposed requirement (paragraph (a)(5) of the proposal, renumbered paragraph (a)(6) in the final) that employees be instructed in safe operating and servicing of equipment (e.g. Tr. I–34, 114, Tr. II–72–73, 157, Tr. IV–85–86, 108). It was pointed out (e.g. Exh. 62) that paragraph (a)(5)(iii) of the proposal, which required employers to instruct operators to wait for all machine movement to stop before servicing or adjusting the machine where a motion hazard was present, did not account for certain service operations, such as the sharpening of chopper blades in some types of forage harvesters, that must be performed with the equipment running. Accordingly, paragraph (a)(6)(iii) provides for appropriate instruction in these circumstances. In addition, the safe servicing and maintenance procedures for all covered equipment, which have been included in paragraph (a)(11) of the final standard, also allow this type of necessary operation where it can be safely performed. Specific training requirements have been included in paragraph (a)(6) as to other safety measures, such as the lockout of electrical equipment, which are required by the standard.

There was also considerable comment as to whether the proposed operating instructions required documentation of training on the part of employers. Although such documentation was not specifically required in the proposal and was not intended, commenters felt it was implicitly required, and expressed opposition to such documentation. They argued that additional paperwork would place an excessive burden on employers, many of whom do not ordinarily keep extensive records, without helping to insure adequate instruction of employees (e.g., Exhs. 15 and 17). Although this question was raised as an issue for the hearing, no one recommended that documentation be required, and we find it inappropriate to add such a requirement at this time. While documentation of the training is not required, the final standard includes the requirement that training be provided upon initial assignment and at least annually thereafter, as does the standard for roll-over protective structures for agricultural tractors (§ 1928.51(d)). For the training program to be effective, and to indicate to employers the extent of their obligation in this area, it was concluded that a specific requirement for training upon assignment and annually thereafter was necessary and appropriate.

(k) *Whether standard railings on cotton gins provide adequate safety where there is a possibility of large belts breaking.* Aside from the question of effective date, this was the only major issue presented on the proposed cotton gin guarding provisions (paragraph (d)). Testimony from the cotton ginning industry (e.g. Tr. IV–69–71, Exh. 126) indicated that large belts are generally being phased out of the system and that employee injuries have not been occurring as a result of breakage of these belts because they are continually inspected to detect any defects. Moreover, when inspection reveals a worn, or otherwise hazardous belt, it is replaced before breakage occurs. As long as belts are inspected on a daily basis and replaced as necessary, we believe employees can be adequately protected. Accordingly, the final rule permits the use of guard railings in paragraph (d), with the additional requirement that all belts be inspected at least daily and replaced if found defective, to assure protection against breakage. Because cotton ginning presents conditions which resemble those in general industry, and because no objection was raised to the proposal in this regard, the design requirements for guard rails are retained in paragraph (d)(1)(ii) of the final standard.

Several other important matters relating to the cotton gin portion of the standard should be mentioned. As noted above, the standard requires complete enclosure (i.e., full guarding) of drives, pulleys, chains and sprockets of cotton gins, as detailed in paragraphs (d)(1)(i), (d)(1)(iv), and (d)(1)(v), and not merely the nip-point guarding permitted for farm field and farmstead equipment. Full guarding was proposed for cotton gins based on the SACA recommendations, and was not alleged by industry to be infeasible.

The standard also requires that existing cotton gins be retrofitted with guards when the cotton gin provisions become effective in June 1977. Here too, no claim was made that employers could not comply with a retrofit requirement, which had been recommended by the SACA and included in the proposal.

An explicit training requirement for authorized employees has been included in paragraph (d)(1)(viii). This paragraph permits use of guard railings, in place of guards or guarding by location, in cotton gin power rooms where access is limited to authorized personnel. This relaxation of the usual requirement is based on the expectation that specially authorized personnel will, because of their training and experience, be adequately protected by guardrails. To assure that authorized personnel are trained in the safe operation and maintenance of power room equipment, and as a specific application of the general training requirement in paragraph (a)(6) of the standard, the explicit training requirement has been included here.

A minor change has been made in paragraph (d)(2)(ii) to make it clear that guards which allow for the use of sticks or other implements to free clogged material are permitted.

(l) *What would be a reasonable effective date for the standard?* The proposed effective dates of this standard, beginning January 1, 1975, have already passed. There was a great deal of comment and testimony on what the final effective dates should be. Such testimony was based to a great extent on the standard as proposed, which included such provisions as full guarding of power transmission components, not required in the final rule, and which would have caused manufacturers major delays, for design and material supply reasons, before they could supply farm equipment in compliance with the standard (Tr. I–115). In addition, the need to make changes in design and production was cited as a reason to require at least a one year lead time for manufacturers (e.g. Tr. IV–86), but since farm machinery is to a large degree presently manufactured in accordance with the final rule (e.g. Tr. I–126, II–80, IV–94) such a lengthy delay does not appear warranted. Finally, the effective dates recommended were based upon the extent of retrofit to be required, and since the final rule limits retrofit, manufacturers will not need a full year to manufacture the parts necessary for employers to meet the requirements of the final rule. Indeed, as to the guarding of PTO shafts, a substantial amount of existing machinery currently complies with the standard and therefore will not need to be retrofitted. And, as to the required warning signs and devices necessary to prevent the inadvertent application of electrical power, these items are commercially available from numerous sources other than agricultural equipment manufacturers.

Accordingly, with the exceptions noted below, the standard will be effective on June 7, 1976. This 90 day delay in the effective date is provided to permit the necessary modifications to be made and, pursuant to section 6(b)(4) of the Act, to insure that affected employers and employees will be informed of the existence of the standard and of its terms. In addition, as noted above, the requirements of paragraphs (b)(2), (b)(3) and (b)(4)(ii)(A), and (c)(2), (c)(3) and (c)(4)(ii)(A) do not apply to equipment manufactured before

Paragraph (c)(5), concerning electrical disconnect means, will be effective on September 7, 1976 it appearing that six months is necessary and appropriate for the installation of the required devices on both existing and newly manufactured equipment.

Paragraph (d), concerning cotton ginning equipment, will be effective on June 30, 1977. This recognizes the intent of the SACA and the Assistant Secretary, at the time of the proposed rule, to allow the cotton ginning industry approxi-

mately two off-seasons to make the changes necessary for compliance with the final rule. In view of the retrofit requirement for guarding of cotton gins, discussed above, this extended effective date is appropriate.

Under section 6(b)(8) of the Act (84 Stat. 1596, 29 U.S.C. 655), whenever a rule promulgated by the Secretary differs substantially from an existing national consensus standard, the Secretary must state the reasons why the rule adopted will better effectuate the purposes of the Act than the national consensus standard. The existing voluntary standards in this area for the most part are clearly not "national consensus standards" within the meaning of sections 3(9) (84 Stat. 1591, 29 U.S.C. 652) and 6(b)(8) of the Act. To the extent that some of these standards, such as ASAE S318.3 "Safety for Agricultural Equipment," have been adopted by the American National Standards Institute (ANSI) and therefore, despite the absence of employee representation on the ANSI committee, may be argued to be national consensus standards, this final standard does not substantially differ from the requirements of such standards. Where differences do appear, and where this final standard does not cover hazards or areas, such as fire protection, specific safety signs, or highway travel, dealt with by these consensus standards, the differences are based on the decision to limit the scope of this standard to hazards posed by moving machinery parts, and on a decision to focus this rulemaking proceeding on the major hazards which exist in the area.

Accordingly, upon consideration of the whole record of this proceeding, and pursuant to section 6(b) of the Act, Secretary of Labor's Order No. 12–71 and 29 CFR Part 1911, Part 1928 of Title 29, Code of Federal Regulations, is hereby amended by adding a new standard on guarding of farm field equipment, farmstead equipment, and cotton gins as subpart D consisting of § 1928.57, reading as follows:

Subpart D—Safety for Agricultural Equipment

§ 1928.57 Guarding of farm field equipment, farmstead equipment, and cotton gins.

(a) *General*—(1) *Purpose.* The purpose of this section is to provide for the protection of employees from the hazards associated with moving machinery parts of farm field equipment, farmstead equipment, and cotton gins used in any agricultural operation.

(2) *Scope.* Paragraph (a) of this section contains general requirements which apply to all covered equipment. In addition, paragraph (b) of this section applies to farm field equipment, paragraph (c) of this section applies to farmstead equipment, and paragraph (d) of this section applies to cotton gins.

(3) *Application.* This section applies to all farm field equipment, farmstead equipment, and cotton gins, except that paragraphs (b)(2), (b)(3), and (b)(4)(ii)(A), and (c)(2), (c)(3), and (c)(4)(ii)(A) do not apply to equipment manufactured before June 7, 1976.

(4) *Effective date.* This section takes effect on June 7, 1976 with the following exceptions:

(i) Paragraph (c)(5) of this section is effective on September 7, 1976.

(ii) Paragraph (d) of this section is effective on June 30, 1977.

(5) *Definitions*—"*Cotton gins*" are systems of machines which condition seed cotton, separate lint from seed, convey materials, and package lint cotton.

"*Farm field equipment*" means tractors or implements, including self-propelled implements, or any combination thereof used in argicultural operations.

"*Farmstead equipment*" means agricultural equipment normally used in a stationary manner. This includes, but is not limited to, materials handling equipment and accessories for such equipment whether or not the equipment is an integral part of a building.

"*Ground driven components*" are components which are powered by the turning motion of a wheel as the equipment travels over the ground.

A "*guard*" or "*shield*" is a barrier which insures that no part of an employee may come into contact with a hazard created by a moving machinery part.

"*Power take-off shafts*" are the shafts and knuckles between the tractor, or other power source, and the first gear set, pulley, sprocket, or other components on power take-off shaft driven equipment.

(6) *Operating instructions.* At the time of initial assignment and at least annually thereafter, the employer shall instruct every employee in the safe operation and servicing of all covered equipment with which he is or will be involved, including at least the following safe operating practices:

(i) Keep all guards in place when the machine is in operation;

(ii) Permit no riders on farm field equipment other than persons required for instruction or assistance in machine operation;

(iii) Stop engine, disconnect the power source, and wait for all machine movement to stop before servicing, adjusting, cleaning, or unclogging the equipment, except where the machine must be running to be properly serviced or maintained, in which case the employer shall instruct employees as to all steps and procedures which are necessary to safely service or maintain the equipment;

(iv) Make sure everyone is clear of machinery before starting the engine, engaging power, or operating the machine;

(v) Lock out electrical power before performing maintenance or service on farmstead equipment.

(7) *Methods of guarding.* Except as otherwise provided in this subpart, each employer shall protect employees from coming into contact with moving machinery parts as follows:

(i) Through the installation and use of a guard or shield or guarding by location;

(ii) Whenever a guard or shield or guarding by location is infeasible, by using a guardrail or fence.

(8) *Strength and design of guards.* (i) Where guards are used to provide the protection required by this section, they shall be designed and located to prevent inadvertent contact with the hazard being guarded.

(ii) Unless otherwise specified, each guard and its supports shall be capable of withstanding the force that a 250 pound individual, leaning on or falling against the guard, would exert upon that guard.

(iii) Guards shall be free from burrs, sharp edges, and sharp corners, and shall be securely fastened to the equipment or building.

(9) *Guarding by location.* A component is guarded by location during operation, maintenance, or servicing when, because of its location, no employee can inadvertently come in contact with the hazard during such operation, maintenance, or servicing.

(10) *Guarding by railings.* Guardrails or fences shall be capable of preventing employees from inadvertently entering the hazardous area.

(11) *Servicing and maintenance.* Whenever a moving machinery part presents a hazard during servicing or maintenance, the engine shall be stopped, the power source disconnected, and all machine movement stopped before servicing or maintenance is performed, except where the employer can establish that:

(i) the equipment must be running to be properly serviced or maintained;

(ii) the equipment cannot be serviced or maintained while a guard or guards are in place; and

(ii) the servicing or maintenance is safety performed.

(b) *Farm field equipment.*—(1) *Power take-off guarding.*

(i) All power take-off shafts, including rear, mid- or side-mounted shafts, shall be guarded either by a master shield, as provided in paragraph (b)(1)(ii) of this section, or by other protective guarding.

(ii) All tractors shall be equipped with an agricultural tractor master shield on the rear power take-off except where removal of the tractor master shield is permitted by paragraph (b)(1)(iii) of this section. The master shield shall have sufficient strength to prevent permanent deformation of the shield when a 250 pound operator mounts or dismounts the tractor using the shield as a step.

(iii) Power take-off driven equipment shall be guarded to prevent employee contact with positively driven rotating members of the power drive system. Where power take-off driven equipment is of a design requiring removal of the tractor master shield, the equipment shall also include protection from that portion of the tractor power take-off shaft which protrudes from the tractor.

(iv) Signs shall be placed at prominent locations on tractors and power take-off driven equipment specifying that power drive system safety shields must be kept in place.

(2) *Other power transmission components.* (i) The mesh or nip-points of all power driven gears, belts, chains, sheaves, pulleys, sprockets, and idlers shall be guarded.

(ii) All revolving shafts, including projections such as bolts, keys, or set screws, shall be guarded, except smooth shaft ends protruding less than one-half the outside diameter of the shaft and its locking means.

(iii) Ground driven components shall be guarded in accordance with paragraphs (b)(2)(i) and (b)(2)(ii) of this section if any employee may be exposed to them while the drives are in motion.

(3) *Functional components.* Functional components, such as snapping or husking rolls, straw spreaders and choppers, cutterbars, flail rotors, rotary beaters, mixing augers, feed rolls, conveying augers, rotary tillers, and similar units, which must be exposed for proper function, shall be guarded to the fullest extent which will not substantially interfere with normal functioning of the component.

(4) *Access to moving parts.* (i) Guards, shields, and access doors shall be in place when the equipment is in operation.

(ii) Where removal of a guard or access door will expose an employee to any component which continues to rotate after the power is disengaged, the employer shall provide, in the immediate area, the following:

(A) A readily visible or audible warning of rotation; and

(B) A safety sign warning the employee to:

(*1*) look and listen for evidence of rotation; and

(2) not remove the guard or access door until all components have stopped.

(c) *Farmstead equipment*—(1) *Power take-off guarding.* (i) All power take-off shafts, including rear, mid-, or side-mounted shafts, shall be guarded either by a master shield as provided in paragraph (b)(1)(ii) of this section or other protective guarding.

(ii) Power take-off driven equipment shall be guarded to prevent employee contact with positively driven rotating members of the power drive system. Where power take-off driven equipment is of a design requiring removal of the tractor master shield, the equipment shall also include protection from that portion of the tractor power take-off shaft which protrudes from the tractor.

(iii) Signs shall be placed at prominent locations on power take-off driven equipment specifying that power drive system safety shields must be kept in place.

(2) *Other power transmission components.* (i) The mesh or nip-points of all power driven gears, belts, chains, sheaves, pulleys, sprockets, and idlers shall be guarded.

(ii) All revolving shafts, including projections such as bolts, keys, or set screws, shall be guarded, with the exception of:

(A) smooth shafts and shaft ends (without any projecting bolts, keys, or set screws), revolving at less than 10 rpm, on feed handling equipment used on the top surface of materials in bulk storage facilities; and

(B) smooth shaft ends protruding less than one-half the outside diameter of the shaft and its locking means.

(3) *Functional components.* (i) Functional components, such as choppers, rotary beaters, mixing augers, feed rolls, conveying augers, grain spreaders, stirring augers, sweep augers, and feed augers, which must be exposed for proper function, shall be guarded to the fullest extent which will not substantially interfere with the normal functioning of the component.

(ii) Sweep arm material gathering mechanisms used on the top surface of materials within silo structures shall be guarded. The lower or leading edge of the guard shall be located no more than 12 inches above the material surface and no less than 6 inches in front of the leading edge of the rotating member of the gathering mechanism. The guard shall be parallel to, and extend the fullest practical length of, the material gathering mechanism.

(iii) Exposed auger flighting on portable grain augers shall be guarded with either grating type guards or solid baffle style covers as follows:

(A) The largest dimensions or openings in grating type guards through which materials are required to flow shall be 4¾ inches. The area of each opening shall be no larger than 10 square inches. The opening shall be located no closer to the rotating flighting than 2½ inches.

(B) Slotted openings in solid baffle style covers shall be no wider than 1½ inches, or closer than 3½ inches to the exposed flighting.

(4) *Access to moving parts.* (i) Guards, shields, and access doors shall be in place when the equipment is in operation.

(ii) Where removal of a guard or access door will expose an employee to any component which continues to rotate after the power is disengaged, the employer shall provide, in the immediate area, the following:

(A) A readily visible or audible warning of rotation; and

(B) A safety sign warning the employee to:

(*1*) look and listen for evidence of rotation; and

(2) not remove the guard or access door until all components have stopped.

(5) *Electrical disconnect means.* (i) Application of electrical power from a location not under the immediate and exclusive control of the employee or employees maintaining or servicing equipment shall be prevented by:

(A) providing an exclusive, positive locking means on the main switch which can be operated only by the employee or employees performing the maintenance or servicing; or

(B) in the case of material handling equipment located in a bulk storage structure, by physically locating on the equipment an electrical or mechanical means to disconnect the power.

(ii) All circuit protection devices, including those which are an integral part of a motor, shall be of the manual reset type, except where:

(A) the employer can establish that because of the nature of the operation, distances involved, and the amount of time normally spent by employees in the area of the affected equipment, use of the manual reset device would be infeasible;

(B) there is an electrical disconnect switch available to the employee within 15 feet of the equipment upon which maintenance or service is being performed; and

(C) a sign is prominently posted near each hazardous component which warns the employee that, unless the electrical disconnect switch is utilized, the motor could automatically reset while the employee is working on the hazardous component.

(d) *Cotton ginning equipment*—(1) *Power transmission components.* (i) The main drive and miscellaneous drives of gin stands shall be completely enclosed, guarded by location, or guarded by railings (consistent with the requirements of paragraph (a)(7) of this section). Drives between gin stands shall be guarded so as to prevent access to the area between machines.

(ii) When guarded by railings, any hazardous component within 15 horizontal inches of the rail shall be completely enclosed. Railing height shall be approximately 42 inches off the floor, platform, or other working surface, with a midrail between the toprail and the working surface. Panels made of materials conforming to the requirements in Table D–1, or equivalent, may be substituted for midrails. Guardrails shall be strong enough to withstand at least 200 pounds force on the toprail.

(iii) Belts guarded by railings shall be inspected for defects at least daily. The machinery shall not be operated until all defective belts are replaced.

TABLE D–1.—*Examples of minimum requirements for guard panel materials*

Material	Clearance from moving part at all points	Largest mesh or opening allowable	Minimum gage (U.S. standard) or thickness
	Inches	*Inches*	
Woven wire	Under 2	½	16
	2 to 4	½	16
	4 to 15	2	12
Expanded metal	Under 4	¾	18
	4 to 15	2	13
Perforated metal	Under 4	½	20
	4 to 15	2	14
Sheet metal	Under 4		22
	4 to 15		22
Plastic	Under 4		(1)
	4 to 15		(1)

[1] Tensile strength of 10,000 lb/in².

(iv) Pulleys of V-belt drives shall be completely enclosed or guarded by location whether or not railings are present. The open end of the pulley guard shall be not less than 4 inches from the periphery of the pulleys.

(v) Chains and sprockets shall be completely enclosed, except that they may be guarded by location if the bearings are packed or if accessible extension lubrication fittings are used.

(vi) Where complete enclosure of a component is likely to cause a fire hazard

due to excessive deposits of lint, only the face section of nip-point and pulley guards is required. The guard shall extend at least 6 inches beyond the rim of the pulley on the in-running and off-running sides of the belt, and at least 2 inches from the rim and face of the pulley in all other directions.

(vii) Projecting shaft ends not guarded by location shall present a smooth edge and end, shall be guarded by non-rotating caps or safety sleeves, and may not protrude more than one-half the outside diameter of the shaft.

(viii) In power plants and power development rooms where access is limited to authorized personnel, guard railings may be used in place of guards or guarding by location. Authorized employees having access to power plants and power development rooms shall be instructed in the safe operation and maintenance of the equipment in accordance with paragraph (a)(6) of this section.

(2) *Functional components.* (i) Gin stands shall be provided with permanently installed guard designed to preclude contact with the gin saws while in motion. The saw blades in the roll box shall be considered guarded by location if they do not extend through the ginning ribs into the roll box when the breast is in the out position.

(ii) Moving saws on lint cleaners which have doors giving access to the saws shall be guarded by fixed barrier guards or their equivalent which prevent direct finger or hand contact with the saws while the saws are in motion.

(iii) An interlock shall be installed on all balers so that the upper gates cannot be opened while the tramper is operating.

(iv) Top panels of burr extractors shall be hinged and equipped with a sturdy positive latch.

(v) All accessible screw conveyors shall be guarded by substantial covers or gratings, or with an inverted horizontally slotted guard of the trough type, which will prevent employees from coming into contact with the screw conveyor. Such guards may consist of horizontal bars spaced so as to allow material to be fed into the conveyor, and supported by arches which are not more than 8 feet apart. Screw conveyors under gin stands shall be considered guarded by location.

(3) *Warning device.* A warning device shall be installed in all gins to provide an audible signal which will indicate to employees that any or all of the machines comprising the gin are about to be started. The signal shall be of sufficient volume to be heard by employees, and shall be sounded each time before starting the gin.

(Sec. 6(b), Pub. L. 91-596, 84 Stat. 1593 (29 U.S.C. 655); Sec. of Lab. Ord. No. 12-71 (36 FR 8754), 29 CFR Part 1911).

Signed at Washington, D.C., this 3rd day of March, 1976.

MORTON CORN,
Assistant Secretary of Labor.

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